

DATA STORAGE DEVICE USING SDRAM

BACKGROUND OF THE INVENTION

1. The field of the invention

[0001] The present invention generally relates to a data storage device, and more particularly relates to a data storage device using a SDRAM controller to control one or more than one SDRAM for data storage.

2. Description of the related art

[0002] The conventional data storage device, such as the hard disk driver, which uses a magnetic element and a motor controlled reading head mechanism to store data, was popular some time ago. However, with the rapid advancement of the information technology and semiconductor know-how, flash memory has been developed for data storage by electrical means. The hard disk driver has advantages over the flash memory, for example, the hard disk driver has more storage capacity and inexpensive compared to the flash memory. However, the disadvantages of the hard disk is that it is larger in size occupying larger space and less resistant to vibrations due to the limit set by the motor controlled reading head mechanism, and therefore the track may get damaged during transportation thereby increasing the maintenance cost of the hard disk. The advantages of using the flash memory as the data storage device compared to hard disk is that it occupies less space and more resistant to vibration. However the flash memory cell structure is vulnerable to error caused by the difficulty of controlling manufacturing process, and therefore the price is much higher than the hard disk driver for the same data storage capacity. Accordingly, with consideration of cost, the flash memory is less attractive.

[0003] Therefore, in the light of the foregoing, it is highly desirable to lower the manufacturing cost of the data storage device and at the same time improve the accuracy of data storage features of the data storage device.

SUMMARY OF THE INVENTION

5 [0004] Accordingly, in the view of the foregoing, the present inventor makes a detailed study of related art to evaluate and consider, and uses years of accumulated experience in this field, and through several experiments, to create a new data storage device using SDRAM that is capable of reducing the manufacturing and maintenance cost and at the same time the accuracy of data storage features is also increased.

10 [0005] According to a primary aspect of the present invention, a data storage device using SDRAM as data storage unit is provided. Further, a SDRAM controller is used to control one or more than one SDRAM.

[0006] According to another aspect of the present invention, a plurality of SDRAM is stacked over each other to form stacked SDRAM for increasing the storage capacity.

15 The data storage device of the present invention is capable of continuously and accurately storing and retrieving data, and it is highly resistant to vibrations. Further, the data storage device of the present invention is capable of reducing the manufacturing and maintenance cost.

BRIEF DESCRIPTION OF THE DRAWING

20 [0007] For a more complete understanding of the present invention, reference will now be made to the following detailed description of preferred embodiments taken in conjunction with the accompanying drawings, in which:

[0008] FIG. 1 is a block layout of a data storage system device using SDRAM of the present invention;

[0009] FIG. 2 is a simplified block diagram of the SDRAM according to one preferred embodiment of the present invention; and

5 [0010] FIG. 3 is a data comparison of SDR SDRAM and DDR SDRAM.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0011] Reference will be made in detail to the preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer
10 to the same or like parts.

[0012] The present invention relates to a data storage device using SDRAM. Referring to FIG. 1, the data storage device 1 comprises a data transmission converting interface 10, a buffer 11, a direct memory storing/retrieving controller 12, a SDRAM controller 13 and at least SDRAM 14. Wherein the data transmission converting
15 interface 10 is connected to a server 20 (such as computer) through wired or wireless means so that the data of the server 20 can be converted by the data transmission converting interface 10 into the storable data that can be saved and stored in the buffer 11. The SDRAM controller 13 controls the direct memory storing/retrieving controller 12 to store the data in the buffer 11 to the SDRAM 14. Either way, the server 20 controls the
20 SDRAM controller 13 to retrieve data from the SDRAM 14.

[0013] Referring to FIG. 1 again, the data storage device 1 is connected to a data retrieving element 30 through a data transmission converting interface 10, such as a CCD or a CMOS image sensor element, to enable current signal retrieved by the data retrieving

element **30** to be converted into the storable data by the data transmission converting interface **10** that can be to saved and stored in the buffer **11**. When the SDRAM controller **13** controls the direct memory storing/retrieving controller **12** again, the direct memory storing/retrieving controller **12** will move the data that is temporarily stored in
5 the buffer **11** to store into the SDRAM **14**.

[0014] As shown in FIG. 1, the SDRAM **14** may be comprised of a DDR SDRAM.

[0015] Additionally, the data storage device **1** comprises a power management module **15** and a dry cell (not shown). When the power management module **15** detects low power supply to the data storage device **1**, the power management module **15**
10 switches to the dry cell to supply power to the SDRAM **14**, to enable the SDRAM **14** to refresh. Besides, with the advanced semiconductor manufacturing process, the SDRAM **14** consumes less power, and a common dry cell is capable of supplying power to a SDRAM **14** for years.

[0016] In the present invention, also shown in FIG. 1, the data retrieving element
15 **30** is an element capable of converting the external data, such as image, sound, light, temperature and so on, into storable data.

[0017] Referring to FIG. 2, the charging time affects the speed of the conventional DRAM, and therefore it is difficult to improve random saving/retrieving time for slitting data, but the address of the next set of data is detectable using the burst mode to
20 save/retrieve data. Therefore, the SDRAM uses interleaved memory module and multi-pipeline technologies to improve the saving/retrieving time of the DRAM in the burst mode. As the continuous saving/retrieving can achieve the synchronous saving/retrieving

efficiency as an external clock, and therefore such kind of DRAM is called SDRAM (synchronous DRAM).

[0018] Furthermore, referring to FIG. 3 DDR SDRAM means double data rate, uses the positive edge and negative edge of the memory clock to present the data once separately, and that's how the data transmission efficiency can be twice that of SDRAM, and whereas in the SDRAM data is shown only in the negative edge of the memory clock, and therefore it is called SDR SDRAM. Additionally, a 2.2 V of DDR SDRAM consume less power compared to a 3.3 V of SDR SDRAM.

[0019] The SDRAM controller 13 can support the above mentioned two types of SDRAM 14, because the data can be electrically stored and the storing/retrieving operation can be synchronized, and therefore the data storage device 1 of the present invention can have the advantages of longer work life and accurate storing/retrieving of the data.

[0020] Thus the SDRAM controller 13 can control one or plural SDRAM 14. When a plurality of SDRAM is used, the SDRAM 14 may be a stacked structure providing a larger memory capacity. The SDRAM 14 has the advantages of less break down chances, occupies smaller space, and lower manufacturing cost. Besides, the data storage device 1 of the present invention has a longer work life and is capable of accurately storing/retrieving data.

[0021] While the invention has been described in conjunction with a specific best mode, it is to be understood that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications, and variations in which fall

within the spirit and scope of the included claims. All matters set forth herein or shown in the accompanying drawings are to be interpreted in an illustrative and non-limiting sense.